

PROJECT PLAN  
FOR  
RECONSTRUCTION WORK IN CENTRAL AMERICA  
  
EL SALVADOR

PHASE I  
OCTOBER 1, 1999 – SEPTEMBER 30, 2000  
AND  
PHASE II  
OCTOBER 1, 2000 – DECEMBER 31, 2001

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U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
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## I. INTRODUCTION

This Project Plan focuses on activities to be accomplished by the Department of Commerce, National Oceanic and Atmospheric Administration, U.S. National Weather Service (hereafter, NWS) for the period through December 31, 2001. This plan supersedes the Phase I Project Plan dated November 1999 since the activities described in that plan have been updated based on further evaluations and meetings with counterpart agencies.

### A. Background

Hurricane Mitch was one of the most powerful and destructive hurricanes to affect Central America. The late October 1998 storm impacted most of the Central America countries, with most damages and losses due to flooding and mudslides from the torrential rains that fell throughout the region. Specific impacts in El Salvador, based on statistics compiled by the Comité de Emergencias Nacional (COEN) were as follows.

Number of people killed:	240
Number of people missing:	19
Number of people injured:	84,316
Number of people evacuated:	55,864
Domestic animals and cattle killed:	23,000
Number of homes destroyed:	1,000
Number of damaged homes:	10,372
Number of damaged bridges:	10
Amount of roads damaged (all types):	3,973 km

Total damages are estimated at US\$1Billion. In all, approximately 5.7 % of the population were affected by the storm, with production losses estimated at 75%. The most affected areas were in the eastern portion of the country, along the border with Honduras.

In addition to the destruction to the economic and social infrastructure by Hurricane Mitch, important portions of the hydrometeorological monitoring network, equipment instrumental in the monitoring and forecasting of these types of events, were also damaged or destroyed.

### B. Purpose of the Project Plan

The purpose of this plan is to document the activities to be performed by the NWS under the Interagency Agreement (IAA) signed on September 14, 1999. The IAA is between the Department of Commerce (DoC) and the U.S. Agency for International Development (USAID) defining reconstruction work in Central America (Hurricane Mitch) and the Caribbean (Hurricane Georges). The IAA incorporates in full the U.S. Department of Commerce's *Implementation Plan for Reconstruction Work in Central America*, July 1999. This Project Plan will address the activities proposed in the DoC Plan and will discuss the problems and issues, objectives, management approach, coordination of activities and applications to other project plans for the reconstruction program.

The focus of the NWS Project Plan is for reconstruction and expansion of hydrometeorological monitoring networks (where appropriate) and the development of early warning systems for weather-related natural disasters (focusing on floods) through provision of technology, technical support and capacity building (training). This Project Plan does not discuss activities to the detail of a work plan but provides specifics as to implementation approaches and presents an overall schedule.

## I. STATEMENT OF PROBLEMS AND ISSUES

Significant problems regarding the adequacy of hydrometeorological monitoring and forecasting capabilities were uncovered during Hurricane Mitch in El Salvador. The existing forecasting (hydrologic and meteorological) and near-real-time hydrometeorological monitoring capacity proved insufficient during the event and impacted on the GOES abilities to properly warn impacted and potentially-impacted areas. In addition, the GOES has minimal early warning system capability for significant weather-related events. A local “flood warning system” exists on the lower Rio Lempa, and although the system worked adequately during Hurricane Mitch, it is rudimentary, relying on radio transmissions by local observers.

However, the problems with the hydrometeorological monitoring network were evident before Hurricane Mitch as the existing system had insufficient areal coverage, obsolete equipment, and poor to non-existent maintenance. Hurricane Mitch has made a bad situation worse by destroying or damaging 22 hydrometeorological monitoring network stations.

The GOES is in the process of preparing an integrated national disaster preparedness program involving all levels of government. This program will require various ministries to work jointly in planning for and managing disasters. However, many agencies still lack the technological tools required to properly administer this program. The NWS activities will necessarily consider the requirements of the GOES program.

Consequently, the NWS program in El Salvador will address activities needed to rebuild capacity for forecasting and early warning capabilities specifically in the following problem areas – 1) Base Infrastructure Reconstruction, 2) Forecast and Early Warning Systems, and 3) Disaster Preparedness and Response. Activities for each of these problem areas were defined through workshops and meetings with the GOES counterpart agencies, meetings with local non-governmental organizations (NGOs) and private volunteer organizations (PVOs) and with the USAID mission in El Salvador. In defining the program for El Salvador, the NWS also considered the needs and requirements outlined in a report compiled jointly by the GOES and the World Meteorological Organization entitled *Natural Disaster Prevention Support and Water Resources Management, Modernization of National Meteorological and Hydrological Services Affected by Hurricane Mitch*, June 1999.

The NWS program in El Salvador is consistent with the USAID/El Salvador Mission Special Objectives Document (SpO), *Reduced Vulnerability of the Rural Poor to Natural Disasters in Targeted Areas*, March 1999. These activities specifically address *Intermediate Result 3* of the SpO, (*Environmental impact of future natural disasters mitigated*) by implementing flood early warning systems in El Salvador.

## II. PROJECT OBJECTIVES

Consistent with the DoC *Implementation Plan for Reconstruction Work in Central America*, the NWS will address the following defined problem areas for El Salvador – 1) Base Infrastructure, 2) Forecast and Early Warning Systems, and 3) Disaster Preparedness and Response. For each area, activities are defined which focus on reconstruction and expansion of hydrometeorological monitoring networks and the development of early warning systems for weather-related natural disasters (focusing on floods) through provision of technology, technical support and capacity building (training). The NWS activities will be designed in coordination with activities defined by other U.S. Government organizations including the DOC and USGS (see Chapter III, Section B of this Plan).

### A. NWS Activities

The NWS Phase I activities are identified in Table 1. These activities are to be completed by September 30, 2000. The NWS Phase II activities are identified in Table 2. These activities will be completed by December 31, 2001. The level of effort for each activity in Phase II (e.g., number of hydrometeorological monitoring stations or radios installed) is contingent on actual costs to implement and unforeseen problems.

An important aspect in the development of this plan is the identification of the appropriate GOES counterpart agencies to which this technology will be transferred. GOES primary counterpart agencies for the NWS in the implementation of these activities are defined as follows. Where applicable these counterpart agencies are referenced in the Table 1 for specific activities.

- **MAG/SMHN** – the *National Meteorological and Hydrologic Service*, located under the *Ministry of Agriculture and Cattle Raising*
- **COEN** – the *National Emergency Committee*, central element in the National Emergency System which is comprised of eight ministries, scientific institutions, international organizations, aid organizations, private industry, and local and department level emergency committees
- **CEL** – *Executive Commission of the Río Lempa*, operates the four hydroelectric power dams in El Salvador (three on the Río Lempa, one on a tributary to the Río Lempa)

The NWS will also work closely with local NGOs (e.g., Partners of America, CHF) where needed especially with the design and implementation of community-based emergency planning systems.

NWS contractors will perform most of the implementation tasks. The NWS, with its contractors, will provide complete installation and check out of all hardware and software.

A Letter of Understanding (LOU) has been executed between the NOAA Hurricane Reconstruction Program and the Dirección General de Recursos Naturales Renovables. This LOU outlines NOAA and GOES activities and responsibilities.

<b>Table 1. NWS Activities for Phase I (through September 30, 2000) - El Salvador</b>			
<b>Problem Area</b>	<b>Activities</b>	<b>Description</b>	<b>Location</b>
Base Infrastructure Reconstruction	Reconstruct and Improve Hydrometeorological Data Collection Networks	1) Install automatic weather stations at observing locations (stations to measure wind speed and direction, ambient temperature, humidity, precipitation, atmospheric pressure, and insolation); communications to Ilopango via Internet and dial-up modems – <b>SMHN</b>	Ilopango and Santa Ana
		2) Provide spare parts and test equipment – <b>SMHN</b>	Maintenance laboratory in Soyapango
Forecast and Early Warning Systems	Implementation of community-based flood warning systems	1) Design and implement automated ALERT-type system for flood prone communities. System comprised of precipitation Data Collection Platforms with satellite transmission located in Chapeltique and San Francisco Gotera and PC base station located at <b>SMHN</b> in Ilopango. – <b>SMHN, COEN</b>	Lower Río Grande de San Miguel
	Training and capacity building	2) One meteorologist and one hydrologist for postgraduate training in operational meteorology and hydrology at the University of Costa Rica – <b>SMHN</b>	San Jose, Costa Rica
		3) Installation, maintenance, operation and data quality control training for NOAA systems for maintenance personnel – <b>SMHN</b>	Ilopango and Soyapango

<b>Table 1. NWS Activities for Phase I (through September 30, 2000) - El Salvador</b>			
<b>Problem Area</b>	<b>Activities</b>	<b>Description</b>	<b>Location</b>
Disaster Preparedness and Response	Training and capacity building	1) Develop concept of operation procedures corresponding to implementation of ALERT system – <b>SMHN, COEN, NGOs, Alcades</b>	Soyapango, Concepción Batres
		2) Operation of PC base station hardware and software for automatic weather stations and ALERT system – <b>SMHN, COEN</b>	Ilopango, Santa Ana, Soyapango, Chapeltique, San Francisco Gotera



<b>Table 2. NWS Activities for Phase II (October 1, 2000 – December 31, 2001) - El Salvador</b>			
<b>Problem Area</b>	<b>Activities</b>	<b>Description</b>	<b>Location</b>
Base Infrastructure Reconstruction	Reconstruct and Improve Hydrometeorological Data Collection Networks	1) Install automatic weather stations at observing locations (stations to measure wind speed and direction, ambient temperature, humidity, precipitation, atmospheric pressure, and insolation); communications to Ilopango via Internet and dial-up modems – <b>SMHN</b>	Acajutla, San Miguel, La Union
		2) Purchase and installation of office personal computers, as needed – <b>SMHN</b>	Ilopango, Soyapango
		3) Maintenance of NOAA-installed systems, as needed – <b>SMHN</b>	All installations, including ALERT hardware
Forecast and Early Warning Systems	Implementation of community-based flood warning systems	1) Fax communications capability provided for Concepción Batres for advisories – <b>SMHN, COEN, Alcade</b>	Río Grande de San Miguel
	National Strategic Implementation Plan	2) Assist with development of short (2-5 years) and long-range (5-10 years) plans for strengthening the agency, developing budget strategies and sustaining the new technologies. This plan will include development of equipment maintenance budgets – <b>SMHN</b>	Soyapango, Ilopango
		3) Installation, maintenance, operation and data quality control training for NOAA	

<b>Table 2. NWS Activities for Phase II (October 1, 2000 – December 31, 2001) - El Salvador</b>			
<b>Problem Area</b>	<b>Activities</b>	<b>Description</b>	<b>Location</b>
Forecast and Early Warning Systems	Training and capacity building	systems for maintenance personnel, continued as needed – <b>SMHN</b>	Ilopango and Soyapango
		4) Operation of PC base station hardware and software for automatic weather stations, continued as needed – <b>SMHN</b>	Ilopango, Soyapango and field stations
Disaster Preparedness and Response	Training and capacity building	1) Operation of PC base station hardware and software for ALERT system, continued as needed – <b>SMHN, COEN, NGOs, Alcades</b>	Soyapango, Concepción Batres
		2) Advanced training for one meteorological technician at the University of Costa Rica, as needed and contingent on funding – <b>SMHN</b>	San Jose, Costa Rica

In addition to the training noted in Table 1, SMHN personnel attended a flood-forecasting workshop in the United States (see Activity Schedule in Section V of this plan). Funding for SMHN attendance at this workshop was from the NOAA regional supplemental program budget (regional workshop budgets), not from the NOAA El Salvador program budget. Two SMHN personnel will also be attending a joint World Meteorological Organization and NOAA sponsored hydrological forecasting course in the United States in October 2000. The costs for this course will also come from the NOAA regional supplemental program budget.

The community-based flood early warning system for the Río Grande de San Miguel will be designed to include the following capabilities.

- Installation of streamflow and precipitation gages sited at upstream locations to measure conditions indicating flooding potential at key municipalities. (This will be accomplished in coordination with USGS.) Data from these measuring stations will be sent to PC base stations located at the SMHN forecast center in Ilopango via satellite. Information regarding the current river conditions and forecasts will be provided to the alcalde in Concepción Batres via facsimile or radio on a routine basis.
- Warning procedures will be developed consistent with existing or planned disaster preparedness plans (e.g., prepared by local NGOs and COEN) to inform the community what this information means and what action to take.

The synoptic weather measurement network will be upgraded with automatic weather stations, replacing the malfunctioning, antiquated measurement equipment currently in use. The synoptic network was selected as the first priority because of its importance in weather nowcasting and forecasting and early warning activities. The synoptic network telecommunications system will consist of data collection platforms transmitting collected data and observations via the Internet back to SMHN in San Salvador. The automatic weather stations will collect data for wind speed and direction, ambient temperature, humidity, precipitation, atmospheric pressure, and insolation. Each site will have a personal computer base station.

All training will be conducted in Spanish and all documentation (e.g., training materials, and user guides) will be provided in Spanish.

## B. Coordination of Activities

The NWS activities will be performed in coordination with activities by USAID, other USG agencies, and other donors. This will be done to eliminate overlap and redundancy as much as possible. Table 3 summarizes the activities to be coordinated in El Salvador.

As indicated in the table, the NWS activities in El Salvador must complement the activities planned for the regional Río Lempa basin program, which covers much of El Salvador. Where possible, the data collected as part of the El Salvador program will be used to supplement the data collected as part of the regional program. The design of both programs will need to ensure that there is a seamless interface between them.

<b>Table 3. Agency Coordination</b>	
<b>Organization</b>	<b>Activities to be Coordinated</b>
NOAA – National Ocean Service	Installation of meteorological sensors on tide gages and at Continuously Operating Reference Sites (for GPS), where applicable
NOAA – National Environmental, Satellite, Data, and Information Service	Implementation of one kilometer resolution satellite imagery capability – coordination of imagery processing hardware and software within counterpart agencies
NOAA – Office of Global Programs	Implementation of climate forecasting capability within counterpart agencies
U. S. Geological Survey	Installation of streamflow gages – coordinate needs for flood early warning systems and co-located meteorological measurements instrumentation; coordinate INTERNET needs and capability requirements
Federal Emergency Management Agency	Coordination on the development of emergency plans to support implementation of flood warning systems and coordination with emergency operations center requirements
USAID – El Salvador Mission	Coordination with implementing NGOs on disaster preparedness and management planning
USAID – GCAP	Coordination on the implementation of a river and flood forecast system for the Río Lempa including installation of streamflow gages (in coordination with the U.S. Geological Survey), densification of the precipitation monitoring network, and integration of flood early warning systems
USAID – OFDA	Coordination with the disaster preparedness assessment and recommended actions, as applicable
Atmospheric Environment – Canada	Coordination with base infrastructure reconstruction and flood early warning system activities to include hardware installation and maintenance
World Bank	Coordination on program expansion, maintenance and sustainability issues
Inter-American Development Bank	Coordination on program expansion, maintenance and sustainability issues
World Meteorological Organization	Coordination on long term program planning and training needs

## B. Applicability to Other Plans

The NWS program in El Salvador is consistent with the needs and requirements outlined in the following, applicable plans and/or reports.

- U.S. Department of Commerce's Implementation Plan for Reconstruction Work in Central America, U.S. Department of Commerce, July 1999
- Project Plan For Reconstruction Work in Central America, El Salvador, Phase I, November 1999
- Project Proposal, Natural Disaster Prevention Support and Water Resources Management, Modernization of National Meteorological and Hydrological Services Affected by Hurricane Mitch – El Salvador, World Meteorological Organization, June 1999
- Special Objective Document, Reduced Vulnerability of the Rural Poor to Natural Disasters in Targeted Areas, USAID/El Salvador, March 1999
- Regional Project Plans, NOAA, November 1999

#### IV. MANAGEMENT PLAN

##### A. NWS Management Structure and Responsibilities

The NWS will provide a management structure to ensure the El Salvador program meets all USAID requirements and commitments. The NWS managers directly responsible for this project include the NWS Project Manager and the El Salvador Country Manager. Their responsibilities are as follows.

##### NWS Project Manager

- Develop and track project schedules and budgets
- Develop overall technical approach and tasks for each country and the region
- Develop country and regional work plans including a detailed cost plan
- Attend program meetings as required by NOAA management and USAID
- Coordinate local and in-country technical advisors, as appropriate
- Work with the NOAA Program Manager to coordinate activities and integrate tasks with other USG agencies
- Address line office, NOAA/DoC and USAID administrative requirements, including reporting requirements
- Provide input to the NOAA Program Manager for the NOAA quarterly progress report due to USAID
- Coordinate Country and Regional Managers and activities, as appropriate
- Coordinate activities with other NOAA line offices
- Develop contractor Statements of Work and Coordination of contractor activities with the NOAA Program Administrator
- Coordinate activities (including country clearances) with the NOAA Program Manager, USAID in-country missions and USAID/Washington program coordinators, as appropriate
- Coordinate with the NOAA Program Manager and the El Salvador Country Manager for additional, future donor support for appropriate project tasks

##### El Salvador Country Manager

- Coordinate all country-specific technical tasks
- Track El Salvador schedules and budgets
- Coordinate all El Salvador activities with the line office project manager, El Salvador USAID mission, counterpart GOES agencies, other USG agencies and any technical advisors and coordinators in El Salvador
- Assist the NWS project manager with the development of a project plan for NWS activities in El Salvador and with administrative and reporting requirements
- Coordinate NOAA/NWS contractor activities in El Salvador
- Coordinate shipping of equipment with the El Salvador USAID mission

- Address personnel safety and security issues with in-field personnel (contractor and government personnel) and the El Salvador USAID missions
- Coordinate activities and requirements with El Salvador Private Volunteer Organizations and Non-Governmental Organizations (NGOs), e.g. development of disaster preparedness/management plans
- Work with the El Salvador SMHN to develop short- and long-term strategic plans
- Work with other donors, including USAID, to expand and extend the implemented programs

#### B. NWS Contact Information

NWS Project Manager – Mr. Robert Jubach  
U.S. National Weather Service  
National Oceanic and Atmospheric Administration  
1325 East-West Highway  
Silver Spring, Maryland 20910  
301-713-0130 x 124  
301-713-1051 (fax)  
[robert.jubach@noaa.gov](mailto:robert.jubach@noaa.gov)

NWS El Salvador Country Manager – Mr. Robert Jubach  
U.S. National Weather Service  
National Oceanic and Atmospheric Administration  
1325 East-West Highway  
Silver Spring, Maryland 20910  
301-713-0130 x 124  
301-713-1051 (fax)  
[robert.jubach@noaa.gov](mailto:robert.jubach@noaa.gov)

#### C. El Salvador USAID Mission Assistance

It is understood that the USAID El Salvador Mission will be the focal point for all NWS activities in the country. This includes acting as the liaison between NWS, its contractors and the appropriate GOES counterpart agencies. Accordingly, the USAID El Salvador Mission will need to assist the NWS El Salvador Country Manager with the following, at a minimum.

- All in-country activities involving the NWS and its contractors including organizing meetings with and support from counterpart agencies, PVOs and NGOs and arranging for translators, if needed
- Country clearances for the NWS and its contractors
- Shipping and storage of equipment into El Salvador
- Development of Letter of Understanding between NOAA and GOES counterpart agencies
- Obtaining office work space, as needed

## B. Measures of Progress

Measures of Progress and Measures of Effectiveness for each of the Problem Areas and activities have been defined in the DoC *Implementation Plan for Reconstruction Work in Central America*. The Measures of Progress are all activity outputs based on successful implementation of the defined activity. The DoC Quarterly Reports will also track progress for the various activities.

## C. Program Sustainability

The NWS will work with the El Salvador USAID Mission, GOES counterpart agencies and other donors to develop a long-term strategy for expanding and sustaining the programs implemented. As discussed earlier, the NWS will initially develop routine maintenance costs for the proposed hardware and software to be installed and then work with the GOES counterpart agencies to ensure that appropriate budgets are defined to sustain these systems. If the budget is beyond the capabilities of the agency, the program will be revised accordingly. The NWS will also hold discussions with donors and Central America regional agencies to determine best approaches to sustain these programs. A separate activity to look at regionalization of certain hardware and software maintenance needs and requirements is provided for in the DoC regional program.

## D. Equipment Turnover

After successful installation and checkout, all hardware will be formally turned over to the GOES. This will be accomplished per any appropriate El Salvador USAID Mission requirements. The GOES will have all maintenance responsibility once the equipment becomes their property. NOAA will perform maintenance (other than routine, preventive maintenance) through 31 December 2001.



## II. SCHEDULE AND BUDGET

Although this plan focuses on activities to take place subsequent to the execution of the IAA between DoC and USAID, the NWS did perform some preliminary activities in order to be prepared to begin the program defined in the July 1999 DoC implementation plan. These preliminary activities included visits to El Salvador to meet with the USAID mission and with the counterpart GOES agencies to begin the planning process. Some visits included field trips to areas where programs will be implemented. Constant dialogue was maintained with the El Salvador USAID mission and, to some degree, with the counterpart agencies, as these project plans were being developed.

### A. Schedule

An implementation schedule for the entire program for key activities is provided in the following table. Schedule priority has been given to those activities most crucial to protecting lives and property, most notably installation of flood early warning systems and components. The installation schedule for the Río Grande de San Miguel flood early warning system is contingent on the installation schedule of streamflow gages by the U.S. Geological Survey.

<b>Table 4. Program Schedule</b>	
<b>Installation, Operational or Implementation Date</b>	<b>Activity</b>
By 30 September 2000	<p>2 – Automatic Weather Stations (Ilopango and Santa Ana)</p> <p>2 – Automatic precipitation stations for flood forecasting on the lower Río Grande de San Miguel (Chapeltique, San Francisco Gotera)</p> <p>1 – Personal computer base station with flood ALERT software for flood forecasting on the lower Río Grande de San Miguel</p> <p>1 – Set of spare parts and test equipment for maintenance of meteorological field equipment, including chart paper for existing measurement systems</p> <p>Postgraduate training for operational meteorologists and hydrologists (training began in June 2000 and will run for 15 months)</p>

<b>Table 4. Program Schedule</b>	
<b>Installation, Operational or Implementation Date</b>	<b>Activity</b>
By 30 September 2000	<p>Installation, maintenance, operation and data quality control training for meteorological systems</p> <p>Operation training for PC base station hardware and software for automatic weather stations and flood warning system</p>
By 31 December 2000	<p>1 – Complete flood forecasting system for the lower Río Grande de San Miguel including all communications links (contingent of streamgage installations by USGS); includes concept of operation definition</p> <p>Installation of office personal computers</p> <p>Development of national strategic implementation plan</p> <p>Beginning of meteorological technician advanced training (if implemented)</p>
By 31 March 2001	2 – Automatic Weather Stations (Acacajutla, San Miguel)
By 30 June 2001	1 – Automatic Weather Station (La Unión)
By 31 December 2001	<p>Emergency maintenance on NWS-installed systems</p> <p>Complete maintenance and operation training for all NWS-systems</p>

## B. Budget

The NWS budget for the first and second phases of the El Salvador program follows the budget outlined in the Interagency Agreement (IAA) between the Department of Commerce and USAID. Detailed activity budgets will be developed in conjunction with selected contractors to ensure adherence to the IAA tranching budgets. The budget breakdown is shown in Table 5.

<b>Table 5. Program Budget</b>					
<b>Problem Area</b>	<b>Activities</b>	<b>Description</b>	<b>Problem Area Budget through 30 September 2000</b>	<b>Problem Area Budget 1 October 2000 – 31 December 2001</b>	<b>Total Problem Area Budget</b>
Base Infrastructure Reconstruction	Reconstruct and Improve Hydro-meteorological Data Collection Network	5 – Automatic Weather Stations  1 – Set of spares and test equipment  2 – Office personal computers  Emergency maint.	\$295,000	\$105,000	\$400,000
Forecast and Early Warning Systems	Implementation of community-based flood warning system  National Strategic Implementation Plan  Training and Capacity Building	ALERT system for the Río Grande de San Miguel (including field monitoring equip.)  Development of strategic plans  2 – students for post graduate training  Installation, maint., operation, and data quality control	\$290,000	\$75,000	\$365,000

<b>Table 5. Program Budget</b>					
<b>Problem Area</b>	<b>Activities</b>	<b>Description</b>	<b>Problem Area Budget through 30 September 2000</b>	<b>Problem Area Budget 1 October 2000 – 31 December 2001</b>	<b>Total Problem Area Budget</b>
		training for field monitoring systems			
Disaster Preparedness and Response	Training and Capacity Building	<p>Development of concept of operation procedures for flood early warning system</p> <p>Operation training of PC base station hardware and software for field monitoring equipment and flood early warning system</p> <p>Advanced training for meteorological technician (tentative)</p>	\$45,000	\$60,000	\$105,000